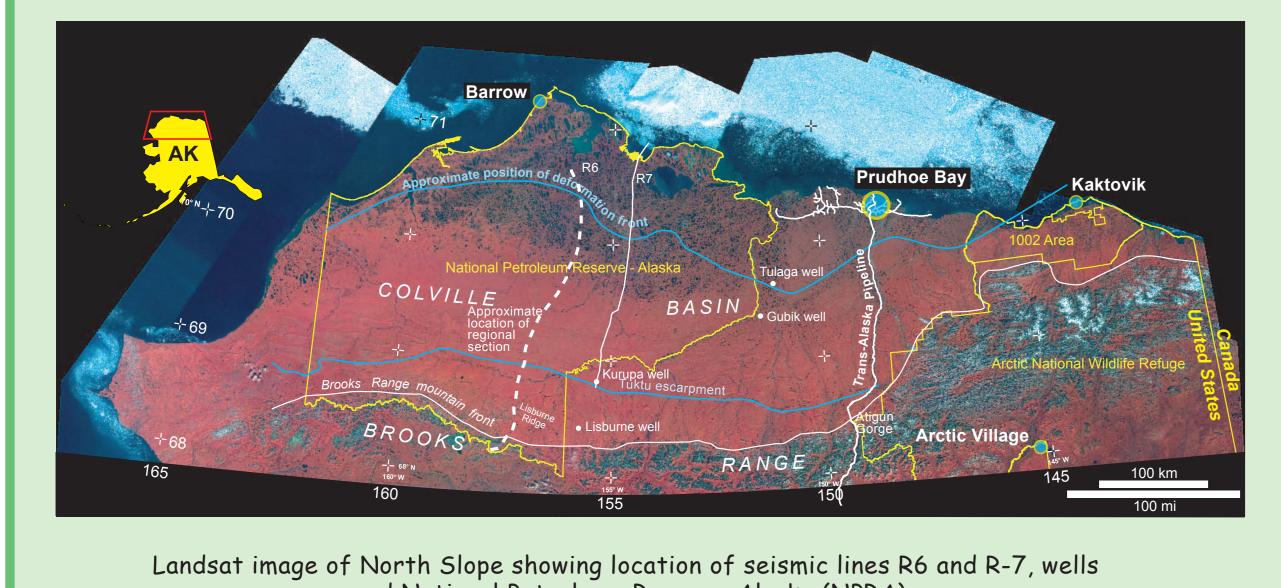
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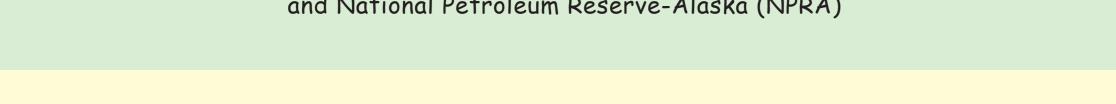
# ASSOCIATION OF DEFORMATION AND FLUID EVENTS IN THE CENTRAL BROOKS RANGE FOLD-AND-THRUST BELT, NORTHERN ALASKA

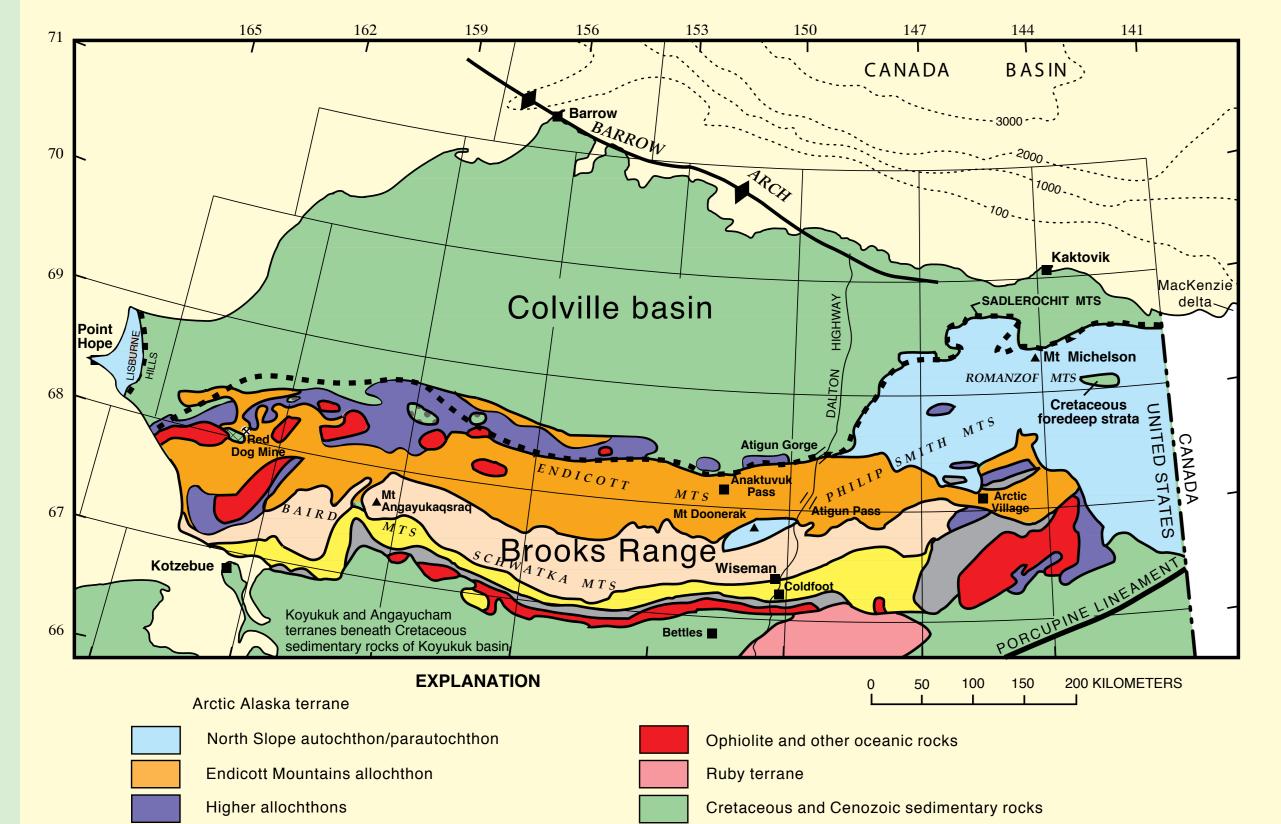
FILE REPORT 03–327
Sheet 1 of 2 Version 1.0

By Thomas E. Moore, Christopher J. Potter, Paul B. O'Sullivan, Kevin L. Shelton, and Michael B. Underwood

# STRUCTURAL GEOLOGY







Tectonic map of northern Alaska. Southern Brooks Range consists of metamorphic rocks, northern Brooks Range of allochthonous sedimentary rocks, and northeastern Brooks Range of parautochthonous strata. Colville basin is foreland basin containing Aptian-Albian and younger strata.

■ ■ ■ Northern front of the Brooks Range

--100--- Bathymetric contour—In meters

0 2 4 6 8 10

Kilometers

Cartoon showing interpretation of Lisburne well relations. Mississippian to Neocomian strata form duplex on

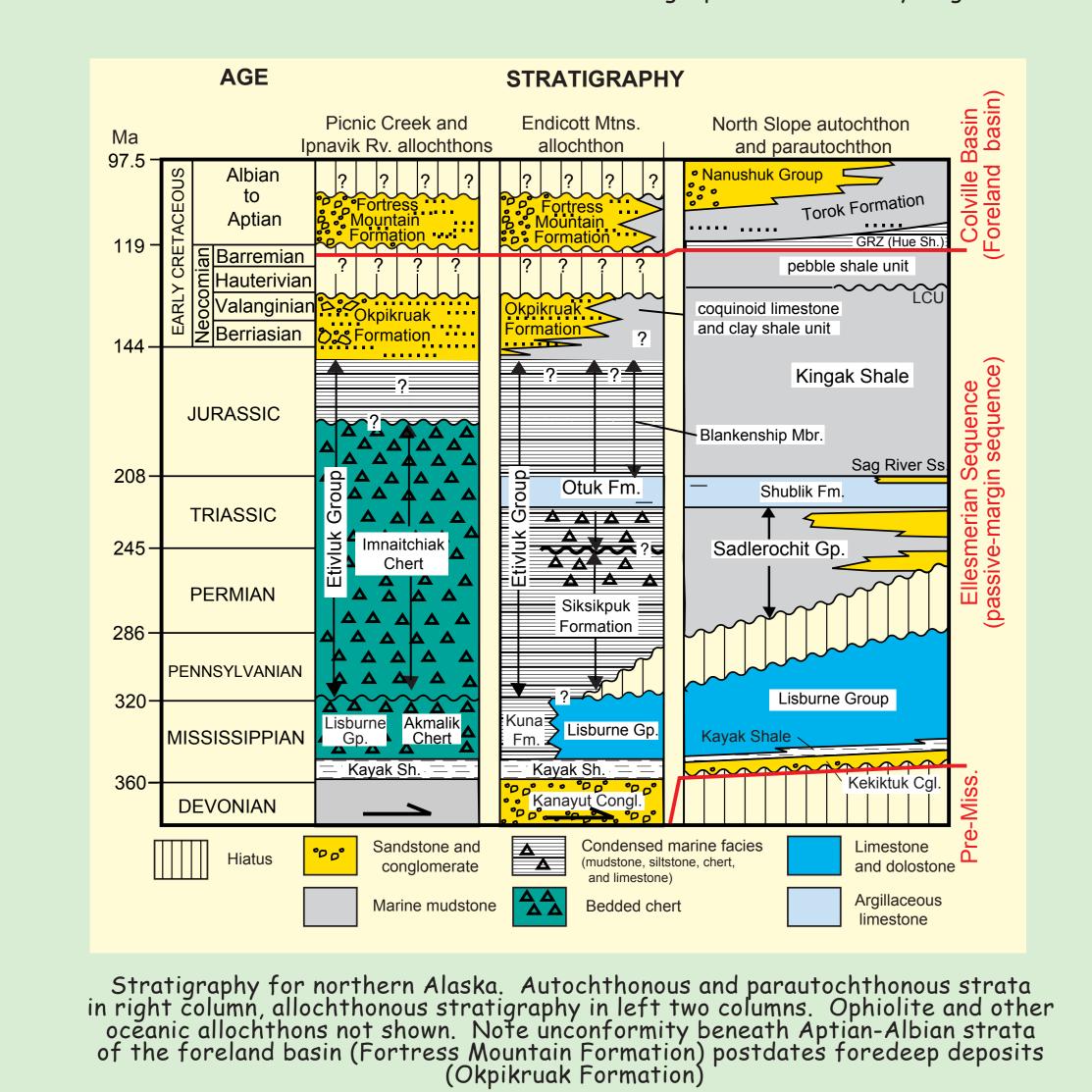
and duplicate older duplex structure and fold overlying Albian deposits. Fission-track cooling ages indicate younger thrusting occurred in the early Tertiary and were never buried more than ~3km.

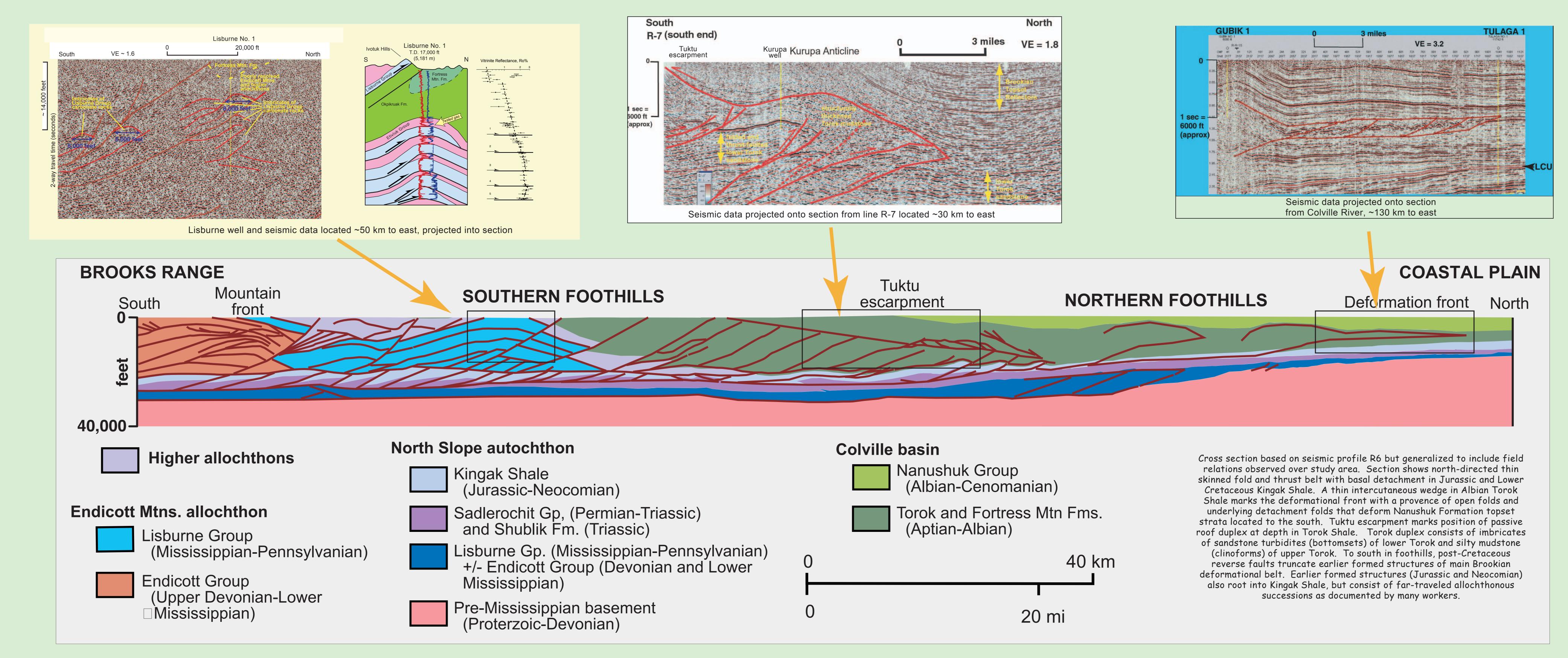
thrusts of probable Neocomian age in Endicott Mountiains allochthon. Post-Albian thrusts (shown in red) truncate

Metasedimentary rocks

Schist belt

Phyllonite





## Syncline folding Aptian-Albian strata of Fortress Mountain Formation (Kfm). Unconformity at base of Aptian-Albian Fortress North-vergent fold in mudstone of upper Torok Fm. in Torok duplex. Antiformal stack of imbricates of Miss.-Penn. Sandstone turbidites of lower Torok Fm. Northeast view of Tuktu escarpment. Roof thrust West view of Kokolik anticline, typical of Mountain Formation (Kfm) in syncline in photo at carbonates of Lisburne Group (Cl). Antiformal forming horse in Torok duplex. of Torok duplex is located in lower right but is covered fold belt developed north of Tuktu stack is truncated and juxtaposed against deformed Albian Torok Shale (Kt) at right. Lisburne well was drilled into this antiformal stack about in this view. Escarpment is formed by resistant Fingmerkpuk Sandstone (Kts) are exposed beneat topset beds of Nanushuk Fm. 40 km to east of this photo. LISBURNE WELL TD 17,000 ft. (5181 m. Tuktu Escarpment

Cartoon showing interpretation of structure in Torok duplex.

Cartoon showing interpretation of structure at Tuktu escarpment. Note south-directed folds in roof of Torok

Cartoon showing interpretation of complex structure in cores of open folds north of Tuktu escarpment.

Fold geometry is mostly locally resolved and consists of fault-controlled detachment folds.

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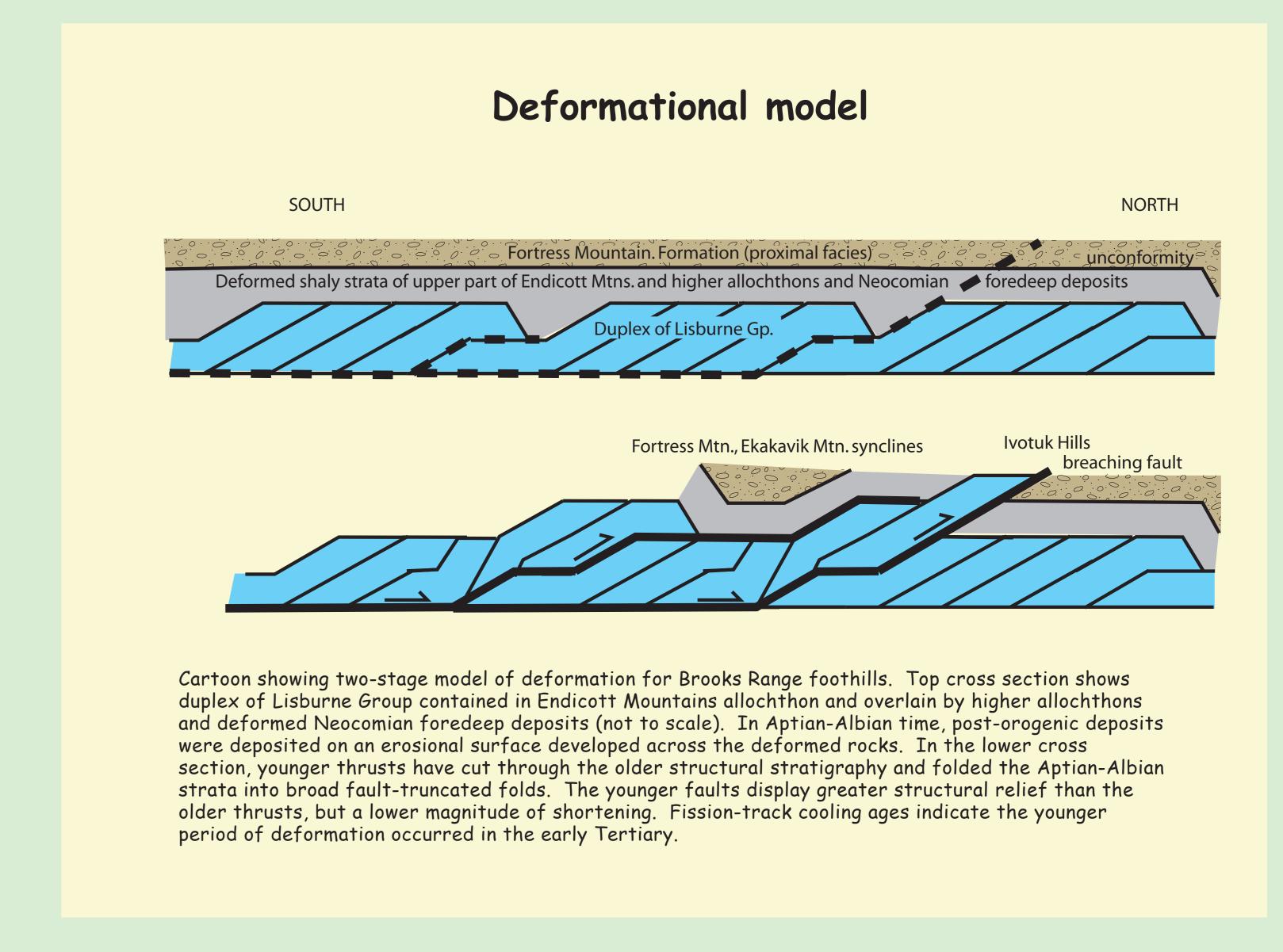
### ABSTRACT

The central Brooks Range consists of two superposed north-directed contractional orogens, one formed between 140-120 Ma and the other at ~60-45 Ma. The older orogen was an arc-continent collisional zone characterized by far-traveled allochthons and relatively low structural relief. The younger orogen is a retroarc thrust belt with relatively low amounts of shortening and high structural relief. Folding and thrusting of the younger episode is superimposed on the thin-skinned deformational wedge of the earlier orogen and also produced a frontal triangle zone in a thick sequence of mid-Cretaceous foreland basin sediments to the north.

□ Stable isotope compositions of calcite and quartz veins indicate two fluid events including: (1) an earlier, higher-temperature (~250-300 °C) event that produced veins in deformed Devonian clastic rocks, and (2) a younger, lower-temperature (~150 °C) event that deposited veins in deformed Mississippian through Albian strata. The fluids in the first event had variable □18O values, but nearly constant □13C values buffered by limestone lithologies. The vein-forming fluids in the second event had similarly variable □18O values, but with distinctly lower □13C values as a result of oxidation of organic matter and/or methane.

□ Zircon fission track ages demonstrate cooling to temperatures below 200 © between 140-120 Ma for the Devonian rocks, whereas zircon and apatite fission track ages show that Mississippian to Albian rocks were never heated above 200 © and cooled below 110-90 © at ~60-45 Ma. These data are interpreted as indicating that the older, high-temperature fluid event was active during thrusting at 120-140 Ma, and the younger fluid event during deformation at ~60-45 Ma.

☐ The data and results presented in this poster will be published in early 2004 in Moore and others (in press).



This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards or with the North American Stratigraphic Code. Any use of trade, firm, or product names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. Government.

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